

Quarks species in a cold genesis theory; theoretic implications of a Vortical quark model

Abstract

By the author's cold genesis theory (CGT), based on the Galileian relativity, it was argued the possibility to explain the massic spectrum of the elementary particles by two species of preonic quasi-crystalline quarks: A) preonics –formed by basic preons $z^0(34 m_e)$ which form bosonic preons $z_2(4z^0)$ and $z_\mu(7z^0)$, and B) quarkonics – formed by 3^n preonic quarks ($4 \geq n \geq 1$) (mainly $-v$ - or/and s -quarks) or as crystalline cluster of $7 \times 5 = 35$ preonic or quarkonic quarks $:(p^+; n^-)$ –nucleonic quarks or -preonic quarks, or $\lambda^\pm, s^\pm, v^\pm$ c - or b - quarkonic quarks, ('charm' , 'bottom'), in two flavors: $f=1$ -of Standard model's variant and $f=2$ –of Souza/CGT's variant. Because the basic z^0 -preons are explained as cluster of paired degenerate electrons, the strong forces between quarks and particles can be naturally explained by the existence of a permanent etherono-quantonic vortex around the super-dense kernel of electron generated by etherono-quantonic winds of the quantum vacuum and by an etheronic centripetal force of Magnus type. As consequence, in CGT can be argued a model of, gravistar' having a shell of dark energy but also of photons vortexed around a rotational hard core (HC) of black hole type which –by matter→energy conversion can obtain periodically an antigravitic (pseudo)charge M_A , by the releasing of heavy etherons of the destroyed degenerate electrons' vortices. The antigravitic field of an enough high value of M_A , produced by the friction between the surface of an internal hard core (HCi) of HC, of black hole type, and the interior surface of a crystalline shell of current strange cold quarks, HCe, could be –in this case, a natural equivalent of the, dilaton' field considered in the EMD theories.

Keywords: quark model, preon, vortical atom, cold genesis, gravistar, antigravitic charge.

Volume 7 Issue 3 - 2023

Marius Arghirescu

State Office for Inventions and Trademarks, Patents Department, Romania

Correspondence: Marius Arghirescu, State Office for Inventions and Trademarks, Patents Department, Romanian Academy, Romania, Email maris3@yahoo.com

Received: September 21, 2023 | **Published:** September 29, 2023

Introduction

In the Standard Model (S.M.), it is known the constituent quark model, with a valence current quark (u-up, d-down, s-strange) or (c-charm, b-bottom, t-top) with a current mass:¹ (1.8÷2.8; 4.3÷5.2; 92÷104) MeV/c², respective: (1.27; 4.18; 173) GeV/c² and a gluonic shell formed by gluons and sea-quarks,¹ the resulted effective quark mass being the constituent quark mass: (336, 340, 486) MeV/c², respective: (1.55, 4.73, 177) GeV/c². The electric charge of u-, c-, t-quarks is $+(2/3)e$ and the electric charge of d-, s-, b- quarks is $-(1/3)e$, the strong interaction of quarks being explained by so-named "color charge", the gluons having two opposed color charges, the gluon field between a pair of color charges forming a narrow flux tube (as a 'string') between them, (the Lund string model).² However, the Grand Unified theories (GUT) predict relations among the fermion masses, such as between the electron and the u-, d-quark, the muon and the

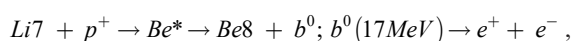
strange quark and between the tau lepton and the bottom quark, but these relations were only partially obtained.

In a Cold Genesis pre-quantum theory of particles and fields, (C.G.T.),³⁻⁵ based on the Galileian relativity, it results as more natural alternative the possibility to explain the constituent quarks and the resulted elementary particles as clusters of negatron-positron pairs, named 'gammons' ($\gamma(e^-e^+)$), resulting that preonic bosons and quarks can be formed also 'at cold', as Bose-Einstein condensate of 'gammons' which form quasi-stable basic preons z^0 of mass $\sim 34 m_e$, forming constituent quarks, (M. Arghirescu, 2006, p. 58).³ This z^0 -preon was deduced by calibrating the value: $m_k = m_e / 2\alpha = 68.5 m_e$ obtained by Olavi Hellman,⁶ by using the masses of the proton and of the Σ -baryon.³

The Olavi Hellman's relation was deduced by a system of non-linear classical field equations having particle-like solutions, this relation being obtained in the form:

$$M = (k-1) \left(\frac{\hbar}{2l_0 c} \right) = (k-1) \cdot m_e / 2\alpha; \quad (k \geq 2; l_0 = \frac{e^2}{m_e c^2} = a_c = 2.82 \text{ fm}; \alpha = 1/137; \hbar = \frac{h}{2\pi}) \quad (1)$$

In a relative recent paper, (2015),⁷ after some experiments for the detection of dark photons, a research team of Science' Institute for Nuclear Research in Debrecen (Hungary) evidenced a neutral super-light particle with a mass of $\sim 17 \text{ MeV}/c^2$, ($\sim 34 m_e$), named X17, by a reaction:



which was explained in CGT by the conclusion that z^0 -preon is composed by two 'quarcins', c_0^\pm , its stability being explained in CGT by the conclusion that it is formed as cluster of an even number $n = 7 \times 6 = 42$ quasclectrons, (integer number of degenerate "gammons", $\gamma^*(e^*e^{*+})$), with mass $m_c^* \approx 34/42 = 0.8095 m_e$, i.e. reduced to

a value corresponding to the charge $e^* = \pm(2/3)e$ by a degeneration of the magnetic moment's quantum vortex $\Gamma_\mu = \Gamma_A + \Gamma_B$, given by 'heavy' etherons of mass $m_s \approx 10^{-60} \text{ kg}$ and 'quantons' of mass $m_h = h \cdot 1/c^2 = 7.37 \times 10^{-51} \text{ kg}$. The considered "gammons" were experimentally observed in the form of quanta of "un-matter" plasma.⁸

The m_c^* -value results in CGT by the conclusion that the difference between the masses of neutron and proton: ($m_n - m_p \approx 2.62 m_e$) is given by an incorporate electron with degenerate magnetic moment and a linking 'gammon' $\sigma_e(\gamma^*) = 2m_e^* \approx 1.62 m_e$, forming a 'weson', $w^- = (\sigma_e(\gamma^*) + e^-)$, which explains the neutron in a dynamide model of Lenard- Radulescu type,³ (protonic center and

a negatron revolving around it by the Γ_μ -vortex with the speed $v_c^* \ll c$, at a distance $r_e^* \approx 1.36 \text{ fm}$ - close to the value of the nucleon's scalar radius: $r_0 \approx 1.25 \text{ fm}$ used by the formula of nuclear radius: $R_n \approx r_0 \cdot A^{1/3}$, at which it has a degenerate μ_e^S -magnetic moment and S_e^n -spin).

The degenerate value μ_e^P of the magnetic moment of a protonic positron (giving its charge, as in the Anderson's model) or of a quasidelectron results in CGT by the decreasing of its Compton radius r_μ^e proportional with the quantum density ρ_n of the protonic N^p - cluster in which is placed the electron's super-dense kernel, (its centroid), from the value: $r_\mu^e = 3.86 \times 10^{-13} \text{ m}$, to the value: $r_i = r_\mu^P = 0.59 \text{ fm}$, (virtual radius of the proton's magnetic moment μ_p) given by the quantum mean density increasing, from the value: ρ_e to the value: $\rho_n \cong f_d \cdot N^p \cdot \rho_e$; (ρ_e ; ρ_n - the mean density of electron and nucleon).

The used electron model supposes an exponential variation of its density, given by photons of inertial mass m_γ , vortically attracted around a dense kernel m_0 and confined in a volume of classic radius $a = 1.41 \text{ fm}$, (the e-charge in electron's surface), the superposition of the (N^p+1) quantonic vortices, Γ_μ^* , of the protonic quasidelectrons, generating a total dynamic pressure: $P_n = (1/2)\rho_n(r) \cdot c^2$, inside a volume with radius: $d^a = 2.1 \text{ fm}$, which gives an exponential nuclear potential: $V_n(r) = -v_i P_n$ of eulerian form conform to :

$$V_n(r) = v_i P_n = V_{n0} \cdot e^{-r/\eta^*}; V_{n0} = -v_i P_{n0}, \quad (2)$$

with: $\eta^* = 0.8 \text{ fm}$ and v_i (0.6fm)-the 'impenetrable' volume,^{3,9} the nucleon resulting as formed by $N^p \approx 54 \times 42 = 2268$ quasi-electrons which give a proton density in its center of value: $\rho_n^o \approx N^p \cdot \rho_e^o = 5.04 \times 10^{17} \text{ kg/m}^3$, ($\rho_e^o = 22.24 \times 10^{13} \text{ kg/m}^3$), giving- with $v_i(a_i) = 0.9 \text{ fm}^3$: $V_s^o = 127.5 \text{ MeV}$ and: $V_s(d = 2 \text{ fm}) \approx 9 \text{ MeV}$ - value specific to the mean binding energy per nucleon in the nuclei with the most strongly bound nucleons, (9.14 9.15 MeV/nucleon for ⁵⁶Fe, ⁵⁸Fe, ⁶⁰Ni, ⁶²Ni), explained by the Bernoulli's law.³

In CGT it was also deduced a quark model of cold forming quark, with effective (constituent) mass giving the particle's mass by the sum rule, by considering as fundamental stable sub-constituent the basic preon $z^0 = 42 m_e^* \cong 34 m_e$ which can form derived "zerons", (preonic neutral bosons: $2z^0$; $z_1(3z^0)$; $z_2(4z^0)$; $z_\mu(6z^0)$, $z_\pi(7z^0)$), the light and semi-light quarks ($m_q c^2 < 1 \text{ GeV}$) resulting by only two preonic bosons: $z_2(4z^0) = 136 m_e$ and: $z_\pi(7z^0) = 238 m_e$.

The cold quarks result as superpositions of preonic bosons $z_2 = 4z^0$ and $z_\pi = 7z^0$ with almost the same symmetry (Figure 1&2), resulting a constituent quark' mass equation:^{4,5}

$$q = m + k \cdot z_\pi + n \cdot (k-2) \cdot z_2; \quad m = (m_1^+; m_2^-); \quad k = 0 \div i = 3; \quad n < k, (n = 0 \div 2) \quad (3)$$

i.e.: $-(k, n = 0) \Rightarrow q = m_{1,2}$, (,mark'-mesonic quark);

$$-(k = 1, n = 0) \Rightarrow q = r^\pm, (,rark'-un-stable quark);$$

$$-(k = 2) \Rightarrow q = p^+, n^-, (park, nark -nucleonic quarks);$$

$$-(k = 3, n = 0) \Rightarrow q = \lambda^+, \lambda^-, (lark -lambda-quark);$$

$$-(k = 3, n = 1) \Rightarrow q = s^-, s^+, (sark -strange quark);$$

$$-(k = 3, n = 2) \Rightarrow q = v^+; v^-, (vark).$$

The values of the basic quarks $m_{1,2}$ (,mark'),^{3,4} are $m_1^+ = 135.2 m_e$ and $m_2^- = 137.8 m_e$ and correspond to a mean value $(1/\alpha)m_e$ obtained by Eq. (1) with $l_0 = a = 1.14 \text{ fm}$, (electron's classic radius corresponding to the e-charge contained by its surface), so: $m = [(1/\alpha) - 0.5 \pm 1.3] m_e$.

The particle's mass results by eqs. (3), in the approximation of the sum rule applied to the particle's cold forming, as consequence of the quantum fields' superposition principle applied to the particle's cold forming as sum of degenerate electrons, whose total vortical field Γ_v can explain also the nuclear force $F_n = -\nabla V_n(r)$ conform to eq. (2).^{3,9}

The main link between CGT and the S. M. consists in the fact that- considering the electron's mass confined in its kernel, the z^0 -preon can be considered as formed by 3 pairs ($u_c \bar{u}_c$) of current u_c -quarks formed by a quasidelectron (e^{*+}) surrounded by 3 gluonic 'gammons', i.e. with mass: $m(u_c) = 7m_e^* \approx 2.9 \text{ MeV}/c^2$, the current d-quark resulting with a mass: $m(d_c) = m(u_c) + w^-(e^- \gamma^*) = (2.9 + 2.62) \text{ MeV} = 5.52 \text{ MeV}$, (in the limits accepted by S.M.).

M. de Souza¹⁰ deduced the energy levels of baryon resonances with maximal discrepancy of ~5% by a rest mass' energy of constituent quarks ($E_q = m_q c^2$) taken as being: $E_q(m_u \approx m_d) = 0.31 \text{ GeV}$, $E_q(m_s) = 0.5 \text{ GeV}$, $E_q(m_c) = 1.7 \text{ GeV}$, $E_q(m_b) = 5 \text{ GeV}$, $E_q(m_t) = 174 \text{ GeV}$, (u, d- up, down; s, c- strange, charm; b, t -bottom, top).

A selection rule for the heavy quarks masses, which- with high discrepancy, may be applied also for the values used by de Souza (which are close to but higher than those used by the Standard Model, m_q^*) was found by R. A. Carrigan Jr.¹¹ which found an exponential formula for the heavy quark masses: $m_c^* = 1.55 \text{ GeV}/c^2$ and $m_s^* = m_b^* = 4.73 \text{ GeV}/c^2$ (values used by the Standard Model of the Quantum mechanics), of the form:

$$m_n^*(q_n) \approx m_1^* x 3^{n-1}; \quad q_n = [(q\bar{q})]_{n-1} \quad (4)$$

$$m_1^*(q_1) = m_s^* \approx 0.486 \text{ GeV}/c^2;$$

Eq. (4) being explained by the forming of compound quarks with upper mass as tri-quark combinations, i.e- as triplets formed by quarks with adjacent lower mass, ($m_2^* \approx 3m_1^*$; $m_3^* \approx 3m_2^*$): two paired quarks ($q\bar{q}$) and an un-paired quark giving the charge and the magnetic moment.

By a z^0 -preon with a ratio: length/diameter $\rightarrow 1$, it results in CGT that the cold quark's stability is given by the (quasi)crystalline arrangement of its cluster of preonic kernels (kerneloids)¹² of regular hexagonal polyhedron form, with the ratio: length/diameter = $1 \div 2$, i.e.- with $3 \div 5$ levels of preonic bosons $z_\pi(7z^0)$ and/or $z_2(4z^0)$ and a light $m_{1,2}$ -quark resulting from a z_2 -boson by the loosing of a degenerate electron e^- .

By the principle of similitude, it results that a similar (quasi) crystalline arrangement may result by kernels of (semi)light quarks ($m_q < 1 \text{ GeV}/c^2$) or of heavy quarks (c- or b-quarks), formed as composite quarks by some (q- q)-pairs and a un-paired q^\pm -quark, also in the form: $q_{k+1} = (7 \times 5)q_k = 17(+ (q_k \bar{q}_k) + q_k$.

It was shown by author¹² that the values m_s , m_c and m_b used by de Souza¹⁰ and those used by the S.M.¹ can be deduced by the CGT's model, with eq. (10), by the next observations:

a. $m_u \approx m_d = 0.31 \text{ GeV}/c^2 \approx 612 m_e \approx m(p; n)$ -the mass of the nucleonic quarks of CGT;

b. $m_s = 0.5 \text{ GeV}/c^2 = 978.5 m_e (\approx m_s^* = 987.8 m_e, \sim 0.504 \text{ GeV}/c^2)$ -the mass of s-quark;

c. $m_c = 1.7 \text{ GeV}/c^2 = 3326.8 m_e$ -charm quark's mass used by de Souza, and;

d. $m_b = 5000 \text{ MeV}$ -bottom quark's mass used by de Souza,

were obtained in CGT by eq. (4), by taking: $m_3 = m_v^+ \approx 1121.2 m_e \approx 574 \text{ MeV}$ (-the mass of v-quark of CGT,

instead of m_s , and by considering the quarks $c(m_c^+)$ and $b(m_c^-)$ as de-excited states of the triplet with mass: $m_4^* = m(c^*) = 3m_v^*(v^+) = 3363.6 m_c$ (1.718 GeV/c²), and respective:

$m_5^* = m(b^{*\pm}) = 3m_c \approx 5.1 \text{ GeV} / c^2$, (q^* - 'cold' quark), by the next de-excitation reaction:

$$c^{*\pm}[(v^\pm \bar{v}^\pm) v^\pm] \rightarrow c^\pm (\sim 1.7 \text{ GeV} / c^2) + z^0 (34 m_e) \quad (5a)$$

$$b^{*\pm}[(c^\pm \bar{c}^\pm) c^\pm] \rightarrow b^\pm (\sim 5 \text{ GeV} / c^2) + z_3 (204 m_e) \quad (5b)$$

$$z_3 = z_\mu = (2x3)z^0 = 2z_1$$

e) The t-quark results as collapsed cluster:

$t^\pm = (7x5)m(b^\pm) \approx 175 \text{ GeV}$, ($17(b\bar{b}) + b^\pm$), the structure of its kernel resulting by similitude with the preonic structure of the s-quark as formed from a pre-cluster of regular hexagonal polyhedron form with length/diameter $\rightarrow 1$, in acceptable concordance with the experimentally obtained value of its constituent mass (176.8 $\approx 177 \text{ GeV} / c^2$,¹³ p. 135), with upper stability given by the crystalline form of its current mass, formed by kernels of b-quarks,¹² the forms:

$h^0 = (7x3)m(c) = 35.7 \text{ GeV}/c^2$ and $(7x5)m(c) = 59.5 \text{ GeV}/c^2$ resulting also as possible.

f. The quarks $s^*(486)c^*(1550)$; $b^*(4730)$ used by the S.M. result from the CGT's quarks: s^- , c^+ , b^- by the reactions:

$$c(1700) \rightarrow c^*(1561) + \pi^0(2z_2); \quad (6a)$$

$$b(5000) \rightarrow b^*(4756) + z_6(2z_\pi); \quad (6b)$$

$$s^\pm(500) \rightarrow s^{*\pm}(483) + z^0. \quad (6c)$$

g) If we interpret the energy: $\Delta E_q = m(\delta_k)c^2$, loosen at the de-exciting of the quarcic cluster q_{k+1}^c , as binding energy between quarks, (by similitude with a nucleus), it may be obtained a semi-empiric relation for the mass of the heavy quarks $c \approx 1.7 \text{ GeV}$ and $b \approx 5 \text{ GeV}$:

$$m(q_n^c) = 3^{n-1} \left[m_1 - (z^0/3) \ln(3^{n-1} 3^{n-2}) \right]; n > 1 \quad (7)$$

with: $m_1 = m_v = 0.574 \text{ GeV}/c^2$; $z^0 = 17.374 \text{ MeV}/c^2$, ($34 m_e$) and $\ln(3^{n-1} 3^{n-2}) = \ln 3^{2n-3}$, which gives:

$$n = 2 \rightarrow m(q_2^c)c^2 = 1.703 \text{ GeV};$$

$$n = 3 \rightarrow m(q_3^c)c^2 = 4.994 \text{ GeV};$$

$$n = 4 \rightarrow m(q_4^c)c^2 = 14.64 \text{ GeV}.$$

A relative similar semi-empiric relation may be found also for the quarks $c^* \approx 1.55 \text{ GeV}$ and $b^* \approx 4.73 \text{ GeV}$, of the S.M., but in the form:

$$m(q_n^*) = 3^{n-1} [(m_1^* + \delta^*) + (z^0/3) \ln 3^{n-2}], n > 1; \quad (8)$$

$$(m_1^* + \delta^*) = (2m_s + m_v - z^0)/3$$

with: $m_1^* = m_s^* \approx 486 \text{ MeV} / c^2$, ($\Rightarrow \delta^* = 33 \text{ MeV} / c^2$), giving:

$$n = 2 \rightarrow m(q_2^*)c^2 = 1.557 \text{ GeV} \approx m(c^*); n = 3 \rightarrow m(q_3^*)c^2 = 4.728 \text{ GeV};$$

$n = 4 \rightarrow m(q_4^*)c^2 = 14.356 \text{ GeV}$, the expression (8) being characteristic to mass addition to the tri-quark cluster, as in the case of

It results, from Eqs. (7), (8), (10), with: $m_1 = m_v(574 \text{ MeV})$, that:

$$\Delta m(q_n^c) = m(q_n^s) - m(q_n^*) = 3^{n-1} \left[m_v - (z^0/3) \ln(3^{n-1} 3^{n-2}) \right] - 3^{n-1} [(m_v - \beta) + (z^0/3) \ln 3^{n-2}], (n > 1) \quad (11)$$

$$\Delta m(q_n^c) = m(q_n^s) - m(q_n^*) = 3^{n-1} [\beta - (z^0/3) (\ln(3^{2n-3}) + \ln(3^{n-2}))] = 3^{n-1} [\beta - (z^0/3) \ln(3^{3n-5})] \quad (12)$$

the Sakharov's equation,¹⁴ (which adds a term of spin-spin interaction at the total mass of quarks).

Quarks 'species' identifiable in CGT

From the previous equations it results that it is possible to classify the quarks obtained in CGT as being of two types (,species'):

-A-species: preonic quarks -composed by the preonic bosons $z_2 = 4z^0$ and $z_\pi = 7z^0$, with mass $m_q(q_A)$ given by Eq. (3) -, which are characteristic mainly to astro-particles;

-B-species: quarkonic quarks (composed of lighter quarks with or without de-excitation reaction), with two sub-species:

- B_1 -tri-quarcic, composed of 3^n preonic quarks (mainly $-v$ - or/ and s-quarks) with $4 \geq n \geq 1$, (with mass $m_q(q_{B1})$ given by Eqs. (7) and (8)), and:

- B_2 -multi-quarcic (with mass $m_q(q_{B2})$ given by: $m_q(q_{B2}) = (7x5)m_q(q_{B1})$ with theoretically possible variant: $m_q(q'_{B2}) = (7x5)m_q(q_A)$), (i.e. composed of preonic quarks).

The fact that the preonic quarks q_A and q_{B1} can explain the ground states of the heavy elementary particles (mainly-heavy mesons and heavy baryons) by two mass ,flavors': of S.M. type and of Souza/CGT type, (Eqs. (6), (7), (8)) can be explained by the conclusion that the ,flavor' $f_q = f_1 = 1$ (of S.M.'s type) corresponds- for B-species, of composite quasi-stable quarks (q_k^*) generated in a strong interaction between lighter quarks (q_{k-1}), at high impact energy, corresponding to a higher mass difference Δm_q between the sum of the q_A -quarks which compose the composite q_{B1} -quark and the mass of the formed q_{B1} -quark, and the second ,flavor' ($f_q = f_2 = 2$ -of Souza/CGT type) corresponds to meta-stable quarks (q_k^s) generated in a semi-strong interaction between lighter quarks (q_{k-1}).

a. -For q_A -quarks of A-species, the general equation for the effective (constituent) quark mass, is:

$$m(q_A) = \left(\frac{1}{\alpha} - 0.5 \pm 1.3 \right) \cdot m_c + k \cdot z_\pi + n \cdot (k-2) \cdot z_2 - (2-f_q) \cdot z^0; [m_c]; \quad (9)$$

($\alpha = 1/137$; $k = 1 + i = 3$; $n < k$; ($k, n \in \mathbb{N}$); $f_q = [1; 2]$)

The values $k = 0$; $n = 0$ correspond in CGT to the basic (mesonic) quark m^\pm , (,mark').

For $k = 3$, $n = 1$, $f = 1$ is retrieved the mass of the s^* -quark (of the S.M.): $s^{*\pm}(483) = s^\pm(500) - z^0$.

b. -For the sub-species $B1(q_{B1})$, by Eqs. (7), (8), assimilating the difference $\Delta m_q c^2$ with a binding energy lost in the formation of the composite quark q_k^* or q_k^s , we can obtain a semi-empiric general equation for the quark's effective mass $m(q_n^c)$ by considering the flavors numbers: $f_q = f_1 = 1$;

$f_q = f_2 = 2$ and that both flavors of composite quarks: q_n^s and q_n^* are obtained from ,cold' v-quarks:

$$(m(v^\pm) \approx 574 \text{ MeV} / c^2), \text{ i.e. by taking in Eq. (8):}$$

$$(m_1^* + \delta^*) = (2m_s + m_v - z^0)/3 = 519 \text{ MeV} / c^2 \quad (10)$$

$$\Rightarrow (m_1^* + \delta^*) = m_v - \beta; \Rightarrow \beta = 55 \text{ MeV} / c^2$$

The resulting general equation for $m(q_n^f)$, for quarkonic quarks $q_n^f = q_{B1}$, is- in consequence:

$$m(q_n^f) = 3^{n-1} \left[m_v - \left(z^0 / 3 \right) \ln \left(3^{2n-3} \right) \right] - (2 - f) \Delta m(q_n^f); (\Delta m(q_n^f) = 3^{n-1} [\beta - \left(z^0 / 3 \right) \ln \left(3^{3n-5} \right)]) \quad (13)$$

$$\text{or: } m(q_n^f) = 3^{n-1} \left[m_v - (2 - f) \beta - \left(z^0 / 3 \right) \ln \left[3^{(2n-3)} / 3^{(2-f)(3n-5)} \right] \right], (\beta = 55 \text{ MeV} / c^2) \quad (13')$$

Eq. (13), by $f = |f_q| = 2$ retrieves Eq. (7) for $m(q_n^s)$ and by $f = |f_q| = 1$ it retrieves Eq. (8) for $m(q_n^*)$.

The mass difference $\beta = 55 \text{ MeV} / c^2$ is characteristic -in consequence, to $f_q = 1$, (strong interaction, at high energies) and it is approximately equal to the mass of the preonic boson $z_1(3z^0) = 52.1 \text{ MeV}$. However, theoretically is not excluded the possibility to take in Eq. (13'), the value: $m_1 = m_s(504 \text{ MeV})$ or $m_1 = m_\lambda(435 \text{ MeV})$, corresponding to a cold quark, (sark or lark), of CGT. From the Annexes C and D of Ref.¹⁵ it results that a de-excitation reaction with emission of z_1 -boson can explain the ground states of the majority of baryons with total spin: $J^p = 3/2$. The conserving of the total, flavor' number imply the conclusion that the flavor of $\Delta(q_n^c)$ is $f_\Delta = 1$ for

$$q_{n-1} = c, \Rightarrow m_n = 59640 \text{ MeV} / c^2; q_{n-1} = c^*, \Rightarrow m_n = 54,495 \text{ MeV} / c^2; q_{n-1} = b, \Rightarrow m_n = 175,271 \text{ MeV} / c^2.$$

The last variant, obtained with $q_{n-1} = b$, corresponds to the top quark, (effective mass $m_t = 177 \text{ GeV} / c^2$).

A general equation for the mass of baryons and of mesons, obtained by CGT

By analysing the Annexes A- D of Ref.¹⁵ it results that:

a. -for baryons:

-almost all baryons with total angular momentum (total spin) $J^p = 1/2$ result from quarks of flavor $f_q = 1$, (of Souza/CGT type), by the sum rule or with a de-excitation reaction corresponding to the loosing of $(1 \div 2) z^0$ -preons, excepting the case of $-\Xi_{cc}^{++}$ (3.621) which results as composed by c^* -quarks of $f_q = 2$, (of S.M. type), or as triplet: (ccp) or (ccn) de-excited by emission of $5z^0$.

- the baryons with total spin $J^p = 3/2$ results from quarks of flavor $f_q = 1$, by de-excitation reaction with emission of at least one z^0 -preon, generally -of three preons (one z^0 -preon/constituent quark)-corresponding to a z_1 bosonic preon, or with emission of a $z_2(4z^0)$ or $z_3(6z^0)$ -preonic boson, excepting four cases, of: $\Lambda_s^{*0}, \Sigma_s^{*0}, \Sigma_c^{*+}$ and Ω_c^{*0} , whose mass results as sum of the masses of their constituent quarks -indicating a weaker (semi-strong) interaction between these quarks at the baryon's forming.

A general semi-empiric equation for the baryons' mass can be written in this case in the form:

$$m(p_b) = \sum_i^3 m(q_k^f) - \delta m_q = \sum_i^3 m(q_k^f) - (n \cdot \frac{1}{6} |\sum f_q| + J^p - 1/2) \cdot z^0; \quad (15)$$

($f = f_q = 2$; $n = 0 \div 2$ for $J^p = 1/2$ and $n = 0 \div 5$ for $J^p = 3/2$); $\delta m_q / m(p_b) < 2.7\%$; (f_q -quark's flavor).

Conform to Eq. (15), the baryon: Ξ_{cc}^{++} (3.621) corresponds to $J^p = 3/2$ and $n = 4$.

The mass defect δm_q represents generally less than 2.7% of the particle's mass mass, (excepting Ξ^{*0} (1532), resulting as: $[(\lambda v v) - z_1]$, for which $m(z_1) / m(p_b) \approx 3.4\%$, corresponding to $J^p = 3/2$; $n = 2$).

Conform to Eq. (15), the baryons which were formed without mass defect, (with $\delta m_q \approx 0$), are considered with $J^p = 1/2$.

quarks and $f_\Delta(\bar{q}) = -1$, at the anti-quark's transforming, because we must take: $f_q(\bar{q}) = -f_q(q)$.

c. For the sub-species B2(q_{B2}), by the formula:

$$m(q_n^c)_{B2} = (7 \times 5) m(q_{n-1}); \quad (14)$$

$$\text{(or simply: } m_n = (7 \times 5) m_{n-1})$$

it results the next possible variants:

$$q_{n-1} = z^0, \Rightarrow m_n = 608.1 \text{ MeV} / c^2; q_{n-1} = m_1, \Rightarrow$$

$$m_n = 2418 \text{ MeV} / c^2; q_{n-1} = p, \Rightarrow m_n = 2418 \text{ MeV} / c^2;$$

$$q_{n-1} = \lambda, \Rightarrow m_n = 15,225 \text{ MeV} / c^2; q_{n-1} = s, \Rightarrow$$

$$m_n = 17,640 \text{ MeV} / c^2; q_{n-1} = v, \Rightarrow m_n = 20,090 \text{ MeV} / c^2;$$

b) For heavy mesons:

-by analysing the Annexes A- B of Ref.¹⁵ it results that the heavy mesons may be explained as pairs $(q_k \bar{q}_l)$ by considering the both variants of the charm and of the bottom quarks: $c^s = c$ and c^* ; $b^s = b$ and b^* , (the Souza's and the S.M.'s mass variants), i.e. with flavor $f_q = 2$ or $f_q = 1$, the pair of heavier quarks being de-excited by a defect mass δm corresponding to the emission of a preonic boson $z_k = n \cdot z^0$ with $n = 0 \div 8$ and which is generally of higher value to the formed pseudo-scalar mesons than to the formed vector mesons.

Because the pseudoscalar mesons have the total angular momentum (total spin) $J^p = 0$ and the vector mesons have $J^p = 1$, it can be written a semi-empiric equation similar to Eq. (15) but considered for $m(p_m) = m(q_k \bar{q}_l)$, in the form:

$$m(p_m) = \sum_i^2 m(q_k^f) - \delta m_q = \sum_i^2 m(q_k^f) - (n - |\sum f_q| - J^p) z^0;$$

$$\delta m_q / m(p_m) < 5\%; (f_q(\bar{q}) = -f_q(q)) \quad (16)$$

$$(|f_q| = [1; 2]; n = 0 \div 8 \text{ for } J^p = 0 \text{ and } n = 0 \div 5 \text{ for } J^p = 1);$$

So, all mesons which can be explained by a reaction of the form (16), by combinations $(q_k \bar{q}_l)$, are in concordance with the CGT's model.

Arguments for a vortical model of electron and a multi-vortical model of meson and baryon

The stability of the vector photon and of the electron's magnetic moment

According to the vortical model of electron, of vector photon and of magnetic field, an electron and a free vector photon must have also a perpetual 'quantonic' vortex Γ_v which gives its magnetic moment and - in the case of the lightest vector photons- also its spin. It was shown in CGT¹⁶ that for the case of a single 'quanton', of mass $m_h = h \cdot 1/c^2$ and radius r_h , it results that its maintaining on the vortex line $l_r = 2\pi r$ around the super-dense centroid of radius r_0 of a vector photon or of an electron, is possible by an etheronic force F_{sh} of Magnus type given

by the quanton's passing with the speed $\omega \cdot r = v_v = c$ through a brownian etheronic medium of variable density $\rho_s(r) \sim r^{-1}$, caused by the electron's or the vector photon's etheronic vortex Γ_a^v of heavy etherons' (sinergons' –with mass $\approx 10^{-60} \text{ kg}$)⁵ having an impulse density: $p_s = r_{sv}(r) \cdot w$, ($w = c\sqrt{2}$), the induced etheronic Γ_h -vortex of the quanton, of circulation: $\Gamma_h(r_h) = 2\pi \cdot r_h v_h$, ($v_h = k_v c$), being explained by the gradient $\nabla p_s = \nabla \rho_s(r)c$ of the relative impulse

$$F_{sh} = 2r_h \cdot \Gamma_h(r_h) \cdot \rho_s(r) \cdot c = 4\pi \cdot r_h^2 k_v \cdot c^2 \cdot \rho_s^0 \cdot (r_0 / r) = m_h c^2 / r = F_{cf}; (\rho_s(r) = \rho_s^0 \cdot (r_0 / r); r \leq r_\lambda) \quad (17)$$

with: $\rho_s^0(r_0)$ - the density of sinergons' at the surface of the vector photon's or the electron's centroid, by considering the quanton as cylindrical, of length $l_h = 2r_h$ and density ρ_h .¹⁷ This dynamic equilibrium (17) is realized by the resulted condition: $4\pi r_h^2 k_v \rho_s^0 \cdot r_0 = m_h = h / c^2$, i.e. –by the condition: $\rho_s^0 k_v r_0 = m_h / 4\pi r_h^2 = 1/2 \rho_h \cdot r_h = \text{constant}$.

With the value resulting from Ref.³ for the ratio: $k_h = 2\pi r_h^2 / m_h = 27.4$, (giving $r_h = 1.79 \times 10^{-25} \text{ m}$), it results:

$$\rho_s(r) k_v \cdot r = \rho_s^0 k_v r_0 = m_h / 4\pi r_h^2 = (2k_h)^{-1} = 1.825 \times 10^{-2} \quad (18)$$

[kg/m²].

The quanton's c-speed can be maintained by a dynamic equilibrium of etheronic pressure forces F^t on the tangent direction, of Stokes type ($F^t \sim v$), given by the Γ_a -vortex having a density $\rho_{sv}(r)$ and by the density $\rho_s(r)$ which generates a drag force:

$$F_r^t = -F_a^t(r).$$

The justification for the conclusion that the interaction of the etheronic fluid composed by 'heavy etherons' (sinergons') with an un-bound quanton is in the laminary regime (specific to the Stokes type force) is the fact that the Reynolds number: $Re = u \cdot L / \nu$ is still low also in this case because- even if $u \approx c\sqrt{2}$ and the kinematic viscosity $\nu = \nu_e$ of the medium of heavy etherons must be low, the specific length L must be approximately the diameter of the quanton, in this case, so –very small, ($L = l_h \approx 2r_h \approx 3.6 \times 10^{-25} \text{ m}$). However, for the interaction of bound quantons with a flux of gravitonic etherons ($m_g \approx 10^{-69} \text{ kg}$)¹⁸ we can consider the turbulent regime, (characterized by Navier-Stokes equations, with $p \approx \rho w^2$), the kinematic viscosity of the flux of gravitonic etherons being lower than that of the, heavy etherons' medium, (the medium of gravitonic etherons –much smaller than the sinergons, being more super-fluid).

By the hypothesis that the etheronic force F_a on the tangent direction is of Stokes type, specific to a laminary flowing of the etheronic medium, at dynamic equilibrium we have:

$$F_a^t = 6\pi l_h \rho_{sv} \nu_e (w - c) = F_a = 6\pi l_h \rho_s \nu_e c = F_r^t \quad (19)$$

$$\rho_{sv}(r) \cdot (w - c) = \rho_s(r) \cdot c; (w \approx \sqrt{2}c, [5]), \quad (20a)$$

$$\Rightarrow \rho_{sv}(r) = \rho_s(r) / (\sqrt{2} - 1), \quad (20b)$$

Particularizing for the case of the electron's magnetic moment vortex, Γ_μ^e , for which Ref.³ gives a density: $\rho_c(a) = \rho_\mu(a) = \rho_e(a) = \mu_0 / k_1^2 = 5.16 \times 10^{13} \text{ kg}$, ($a = 1.41 \text{ fm}$), and by using the formula: $B = k_1 \rho_c v_v$, ($k_1 = 4\pi a^2 / e$), for the electron's B-field,³ with $v_v = c$ for $r \leq r_\lambda^c$, by using for the magnetic potential the relation obtained in CGT,³ it results that :

$$A(r) = 1/2 B \cdot r = 1/2 k_1 \rho_c \cdot c \cdot r = 1/2 k_1 \rho_{sv} w \cdot r; \quad (21a)$$

density p_s of etherons related to the quanton's surface, maintained by etheronic winds.¹⁷ A similar gradient, $\nabla \rho_{sv}(r)w$, of the Γ_a -vortex, generates a Γ_h -vortex to pseudo-stationary quantons which are attracted towards the vector's center. The condition of the quanton's maintaining on the vortex-line is given by the dynamic equilibrium equation:

$$\Rightarrow \rho_{sv}(a) = \rho_c(a) / \sqrt{2} \\ \rho_s(a) = \rho_{sv}(a) \cdot (\sqrt{2} - 1) = \rho_c(a) (1 - 1/\sqrt{2}); \quad (21b)$$

By taking: $w = \sqrt{2}c$,³ it results:

$$\rho_s(a) = 0.29 \rho_c(a) \approx 1.49 \times 10^{13} \text{ kg/m}^3; (a = 1.41 \text{ fm}).$$

From Eq. (20) we have also: $\rho_s(a) = 1.825 \times 10^{-2} / a \cdot k_v$, resulting that: $k_v \approx 0.87$, ($v_h \approx 0.87c$), i.e.- a value which corresponds to the used hypothesis that the magnetic moment of electrons and of vector photons is given by an etherono-quantonic vortex induced by etherono-quantonic winds. For $r_0 \approx 10^{-20} \text{ m}$, (value corresponding to a density of $3.6 \times 10^{19} \text{ kg/m}^3$ of the inertial mass $m_v \approx 2.3 \times 10^{-40} \text{ kg}$ of a vector photon),³ by Eq. (18) we obtain:

$\rho_s^0 \approx a \cdot \rho_s(a) / r_0 = 3.5 \times 10^2 \rho_c(a) \gg 2.1 \times 10^{18} \text{ kg/m}^3$, (with one size order of magnitude higher than the nucleon's density). By Coandă effect, an etheronic vortex (but of gravitonic etherons) and an etheronic force of Magnus type can explain the stability of the sinergonic vortex Γ_A which –in CGT, explains the observed physical nature of the magnetic potential A of the electron's magnetic moment.

The perpetual rotation of the atomic electrons

It is know that the persisting currents in a superconductor, which flow at the superconductor's surface to oppose the applied field and which expel the magnetic field of an external magnet, are not a result of Lenz's Law or Faraday's Law, (are not induced by change in flux), and that they do not decay with time, giving the illusion of perfect diamagnetism. Conform to CGT, we may suppose that the etheronic ('sinergonic') Γ_A -vortex associated to the A-potential which induces the magnetic vortex-tubes ξ_B of the magnet's B-field, can maintain the intensity of the persisting current of electrons and of electronic Cooper pairs in a supraconductor, by its dynamic (etheronic) impulse density:

$p_A = \rho_{sv} w = \rho_c c$, ($w \approx c\sqrt{2}$), conform to a dynamic equilibrium equation (19), (20) multiplied by a f_a -factor ($f_a \ll 1$) imposed by the superfluidity of the etherono-quantonic medium (in which the drag force tends to zero). A similar but nuclear Γ_A -vortex can explain the perpetual rotation of the atomic electrons, in CGT.³ In the case of the hydrogen atom- for example, the quantified electron's speed: $v_e(r_n) = v_e^0(r_0)/n$, ($r_n = n^2 r_0$; $n = 0, 1, 2, \dots$), gives the variation law: $v_e(r_n) = c \cdot \sqrt{(2a/r)}$, which can be explained by an equation of dynamic equilibrium on the direction tangent to the electron's rotation:

$$F_A = F_R; \Rightarrow \rho_w(r) [w - v_e(r)] = \rho_R(r) v_e(r); \quad (22)$$

$$(w = c\sqrt{2}; \rho_R(r) = \rho_w(r) [\gamma_p \cdot \sqrt{(r/a)} - 1]); a = 1.41 \text{ fm}$$

with: $p_A = \rho_w w = \rho_c v_c = B(r) / k_1$ - impulse density of the etherono-quantonic vortex Γ_μ of the nuclear proton's magnetic moment, μ_p and: $\rho_R(r)$ the equivalent density of the low frictional Brownian (etherono-quantonic) medium which generate a drag force F_R of Stokes' type.

The expression of $\rho_R(r)$ in Eq. (22) results by correspondence with Eq. (20) at least for $r = 2a$. The coefficient $\gamma_p = e^{r_0/r}$, ($r_0 = \hbar/m_p c \approx 0.21 \text{ fm}$), is imposed by the exponential variation of the quantonic density given by the superposed Γ_μ -vortices of the proton's cluster of degenerate electrons in the volume of radius $r = 2a$, ($a = 1.41 \text{ fm}$), with their kernels confined in a protonic 'impenetrable' quantum volume of radius $r_i \leq 0.6 \text{ fm}$.^{3,4}

For: $r = 2a$,

with $v_e(r) = k_v c$, ($k_v \leq 1$), we have:

$$\rho_w(r) [c\sqrt{2 - k_v}] = \rho_R(r) v_e(r) = \rho_w(r) [\gamma_p \sqrt{(2a/a) - 1}] k_v c \Rightarrow k_v = 0.92; (\gamma_p = \gamma_p(r)) \tag{23}$$

(with: $\rho_w = \rho_c v_c / w = B(r) / \sqrt{2} k_v c$ -the sinergonic vortex Γ_A resulting as pseudo-vortex with w - quasi-constant). It is observed that the speed of a beta radiation's electron ($\sim 0.92c$) is obtained (Eq. (23)) for: $r = 2a$.

For $r \gg a$, (i.e. -for the case of an atomic electron), because in this case $v_e \ll c$, we have:

$$r \gg a, \Rightarrow \rho_w(r) [c\sqrt{2 - v_e(r)}] \approx r_w(r) c\sqrt{2} \Rightarrow v_e(r) = c\sqrt{(2a/r)}; \tag{24b}$$

It can be shown that -without the, sinergonic' vortex of the atomic nucleus' magnetic moment, because the density of the etherono-quantonic component of the, zero point' energy of the quantum vacuum, the atoms would have a relative short existence, because the, drag force' F_R generated by this medium would determine the loosing of the electron's kinetic energy and its falling to atomic nucleus. For a released electron at the neutron's beta transforming, but also for quantons of the nuclear proton's magnetic moment: $\mu_p = 2.79 \mu_N$, (μ_N -the nuclear magneton), corresponding to a Compton radius: $r_\mu^p = 2\mu_p / ec = 0.59 \text{ fm} \approx r_i$ (theoretic radius of the proton's impenetrable quantum volume), Eq. (23) of dynamic equilibrium gives $v_h = c$ (until) at the limit: $r_1^p = 2.35 \text{ fm}$ and it is explained by the coefficient γ_p , i.e. by the Compton radius of the photons contained in the proton's quantum volume, which decreases from the value: $r_\lambda^e = \hbar / m_e c = 386 \text{ fm}$ -specific to a photon contained by the electron's volume, to the value: $r_\lambda^f = (\bar{\rho}_e / \rho_p^a) \times r_\lambda^e \approx 0.9 \text{ fm}$ -for the photons contained in the proton's surface, of theoretic scalar radius $r_p^s \approx 1.4 \text{ fm}$, (r^e extending the protonic volume with quantons circulated at $v_{ct} = c$, to one of radius: $r' = r_\lambda^f + r_p^s \approx r_\mu^p, \bar{\rho}_e$ and ρ_p^a - being the electron's mean density and the density of the proton's surface, considering an exponential decreasing of its density.³ The apparent contradiction between the obtained values $r_1^p = 2.35 \text{ fm}$ and $r_\mu^p = 0.59 \text{ fm}$ is solved in CGT by a semi-empiric relation for the quantons' speed in the vortex $\Gamma_p = 2\pi r v_{ct}$ of the proton's magnetic moment, of the form:³

$$v_{ct}(r) = \begin{cases} \approx c, & \text{for } r < r_1^p \cong 2.35 \text{ fm}; \\ c \left(\frac{r_\mu^p}{r} \right)^{\left(1 - \frac{r_\mu^p}{r} \right)}, & \text{for } r \geq r_1^p \cong 2.35 \text{ fm}; \quad (r_\mu^p = r_i = 0.59 \text{ fm}) \end{cases} \tag{25}$$

which - for $r \gg r_1^p$, gives: $v_{ct} \approx c \cdot (r_\mu^p / r)$, which retrieve the classic expression of magnetic induction by the CGT's formula, with a variation of the density of quantons: $\rho_c(r) = \rho_c^a (a/r)^2$, ($\rho_c^a = \mu_0 / k_1^2$), i.e.:

$$B = k_1 \rho_c(r) v_{ct}(r) = k_1 \frac{\mu_0}{k_1^2} \left(\frac{a}{r} \right)^2 c \left(\frac{r_\mu^p}{r} \right) = \frac{\mu_0}{4\pi r^3} e c r_\mu^p = \frac{\mu_0}{2\pi} \frac{\mu_p}{r^3} \tag{26}$$

It exist a phenomenon named "cryogenic electron emission," that has no known physics explanation. At very cold temperatures, in the absence of light, a photomultiplier will spontaneously emit single electrons. The phenomenon was first observed nearly 50 years ago. The electrons are emitted in bursts distributed randomly in time. As the temperature decreases, the rate of bursts, as well as the number of events per burst, increase. Although scientists know of a few causes for electron emission without light (also called 'the dark rate'), including heat, electric field and ionizing radiation - none of these can account for cryogenic emission.¹⁹ It can be observed that this phenomenon is in concordance with the vortical atomic model, i.e. with the conclusion that the atomic electrons are rotated under the pressure force generated by a vortex of heavy etherons of the magnetic potential A which generate the B-field of the nuclear magnetic moment, μ_N which acts more efficient over the electrons of an un-vibrated atom, (at lower temperatures).

Theoretic implications in astrophysics of a (multi) vortical model of nucleon

Arguments for a 'gravistar' model

An important theoretic consequence of the (multi)vortical model of quark and of elementary baryonic particle, of CGT, (particularly-nucleon), is a 'gravistar' model,³ conceived as a hard-core rotation ellipsoid of "dark energy" with vortically generated "dark photons" and "dark particles" formed as Bose-Einstein condensates at distinct levels of density.

This gravistar model was inspired by the model of "gravistar" proposed by Mottola and Mazur²⁰ with very cold core with central "black hole" and a "dark energy" fluid which may create Bose-Einstein condensate in the outer core, and a thin shell of matter on the events horizon, the dark energy-like behavior of the inner region preventing the collapse to a singularity and the presence of the thin shell preventing the formation of an event horizon, avoiding the infinite blue-shift. Also, the inner region of this gravistar has thermodynamically no entropy and may be thought of as a gravitational Bose-Einstein condensate.

In the model of hard-core gravistar proposed in CGT,³ a region of vortexed elementary particles, plasma and photons can exist inside an ellipsoidal region of "dark" etherono-quantonic energy, forming a relativist etherono-quantonic vortex: $H_\mu^C = 2\pi r \cdot v_c$, ($v_c \rightarrow c$), with the etheronic part formed by heavy etherons (sinergons') generating the magnetic potential A of a strong (magnetaric) magnetic B-field generated by the magnetic moment μ_{BH} of a rotated hard-core, similarly to the electron case. This gravistatic hard core (HC) of mass M_C must be a black hole but in the sense that at least the quantons ($m_h = h \cdot 1/c^2$) and, trapped' vector photons are maintained on circular orbit around the gravistatic hard core by a quantum potential $V_\Gamma(r)$ generated by a force $F_M(r)$ of Magnus type, which satisfy the stability condition conform to Eqs. (19)-(22), (and not purely gravitational- in this case), the pseudo-scalar photons of mass $m_f = h\nu / c^2$, speed $v_f \leq c$ and density ρ_f of the inertial mass of its vector photons, (formed as couple of vector photons with opposed spins and magnetic moments -in CGT),¹⁷ being retained when the sum between the gravitation potential $V_g(r)$ and the gravito-magnetic potential $V_{gm}(r) = v_i P_s$ (conform to Eq. (2)), (given by the static pressure $P_s(r)$ of the pseudo-stationary etheronic medium of heavy etherons gravitationally accumulated around the gravistatic hard core), becomes equal to the centrifugal potential, i.e.:

$$E_c = \frac{1}{2} m_f v_f^2 = V_g(r) + V_{gm}(r) = m_f (GM_C / r + P_s(r) / \rho_f); \tag{27}$$

$$(m_f / \rho_f = v_i)$$

The magnetic field B of a gravistar can be generated- as in a black-hole's case, by the charged plasma of a rotated accretion disk or/ and the electric charge of the rotated HC, (or –low probable, and by its permanent magnetization). Also, if HC is a spinning black hole, it can generate matter → energy conversion in the known mode, destroying nuclear matter and releasing polar relativist jets of radiation and elementary particles.

- It is known in this sense that spinning black holes with accretion disks are thought to generate very strong magnetic fields, which are presumably responsible for the astrophysical jets that have been observed in several systems.²¹ Relativistic jets are beams of ionized matter accelerated close to the speed of light. Most have been observationally associated with central black holes of some active galaxies, radio galaxies or quasars, and also by galactic stellar black holes, neutron stars or pulsars. Massive central black holes in galaxies have the most powerful jets, but their structure and behaviors are similar to those of smaller galactic neutron stars and black holes. These systems are often called microquasars'. Relativistic jets formation may also explain observed gamma-ray bursts. But the mechanisms behind the composition of jets remained uncertain. Some studies favor models where jets are composed of an electrically neutral mixture of nuclei, electrons, and positrons, while others are consistent with jets composed of positron–electron plasma, as in case of quasars 3C278 and 3C345.²²

About 1% of supermassive black holes have an “accretion disk” of gas and dust swirling around them. When material from this disk falls toward the black hole, it gets so hot that it shines more brightly than the whole rest of its galaxy. One in 10 of these active black holes also produces jets that fire out particles at 99.995% of the speed of light. Astrophysicists suspect that accretion disks produce the jets, but they don't know how. The researchers chose for its association with a natural cosmic lens. Schild and his colleagues²³ found that for the quasar Q0957+561 the jets appear to emerge from two regions of 1,000 astronomical units in size located above the poles of the central compact object, and that location would be expected only if the jets were powered by reconnecting magnetic field lines that were anchored to the rotating supermassive compact object within the quasar. It was concluded that by interacting with a surrounding accretion disk, such spinning magnetic field lines spool up, winding tighter and tighter until they explosively unite, reconnect and break, releasing huge amounts of energy that power the jets, this magnetic field being internally anchored to a central, rotating supermassive black hole, the inner edge of the accretion disk, located about 2,000 astronomical units from the central object, being heated to incandescence by the swirling, internal magnetic field, pulled around by the rotation of the central compact object, (“magnetic propeller effect”).

Observations also suggest the presence of a broad cone-shaped outflow from the accretion disk. The surprisingly large angular opening of the outflow that is observed is best explained by the influence of an intrinsic magnetic field contained within the central compact object in this quasar. With Kerr's equations, Blandford and Znajek showed²⁴ that when magnetic field lines from the accretion disk fall onto the spinning hole, the black hole's rotation will wind the field lines into a helix oriented along the hole's rotation axis, for the most part of its matter the disk being locked in place, (“magnetically arrested disk” or MAD models). Because the magnetic fields in motion generate E-field, a current of electrons and positrons will start flowing through the helix away from the black hole in both directions, forming the jet. But in light of the previous observations, Schild and his colleagues²³ have proposed a controversial theory that

the magnetic field is intrinsic to the quasar's central, supermassive compact object, rather than only being part of the accretion disk, proposing the name- Magnetospheric Eternally Collapsing Objects, (MECOs) and concluding that in addition to its mass and spin, the quasar's central compact object may have physical properties more like a highly redshifted, spinning magnetic dipole than like a black hole. For that reason, most approaching matter does not disappear forever, but instead feels the motor-like rotating magnetic fields and gets spun back out.

According to this theory, a MECO does not have an event horizon, so any matter that is able to get by the magnetic propeller is gradually slowed down and stopped at the MECO's highly redshifted surface, with just a weak signal connecting the radiation from that matter, but that signal is very hard to observe.²³ This explanatory hypothesis is in concordance with the fact that Black holes become electrically charged when charged particles falls into them, up to an “extremal limit,” a saturation point where they store as much electric charge as possible for their size.

- By the vortical model of magnetic field used in CGT,³ the previous hypothesis is in concordance with the proposed model of gravistar.

-Also, because in the polar zones the radial speed of these emitted jets are less affected (diminished) by the dynamic pressure $P_{\Gamma d} \approx \frac{1}{2} \rho_{\Gamma} c^2$ of the etherono-quantonic vortex Γ_{μ}^C of the HC's magnetic field, the fact that these spinning black holes can emit relativist jets, by the resulting gravistar model it can be explained.

-It is also considered that four years of observations from the European Space Agency's Integral (INTErnational Gamma-Ray Astrophysics Laboratory) satellite have cleared up the origin of a giant cloud of antimatter surrounding the galactic center of Milky Way, by observing a glow of 511 keV gamma rays from electron-positron annihilation. It was concluded that hard low-mass X-ray binaries, since they light up in high-energy (hard) X-rays as gas from a low-mass star spirals into a companion black hole or neutron star, they are producing significant amounts of positrons .

But scientists don't understand how low-mass X-ray binaries could produce enough positrons to explain the cloud, and they also don't know how they escape from these systems.²⁵

- It can be observed that the quark model of CGT, resulting as Bose-Einstein condensate of ,gammons'- considered as pairs of degenerate electrons: $\gamma^*(e^* e^{*+})$, which –logically, are released in the matter → energy conversion process, can explain the considered composition of the emitted relativist jets, consisting in electrons, positrons, electron-positron pairs and gamma quanta.

The gravistar as source of dark energy

The Universe' expansion is considered as caused by the ,dark energy' of the cosmic space. In CGT,³ in concordance with some astrophysical observations,²⁶ this energy is an etheronic field-like component of the quantum vacuum; similar etheronic un-compensated fluxes can explain the gravitation force as in the Fatio-Lesage theory.^{3,18} A 32-year-old hypothesis of the formation of barred-spiral galaxies (Bostick 1957, 1958, 1986; Laurence, 1956) which become coherent-self-exciting homopolar generators has recently gained confirmative support from 3-D, particle-in-cell computer simulations.²⁷ According to this model, such galaxies should be able to convert an appreciable fraction, f , of the energy from their gravitationally-collapsing plasmas to coherently-increasing magnetic energy via their coherent, self-exciting, homopolar-generator action. The following simple calculation shows

that the resulting mutually-induced magnetic repulsions (Lenz’s law) between neighboring galaxies is greater than the gravitational attractive forces between the galaxies. It was concluded that the observed expansion of the Universe can be thus simply accounted for, without recourse to the ‘Big Bang’ hypothesis.²⁷ But the existence of the dark energy could explain and other astrophysical observations.

-It was also concluded that the supermassive black holes in elliptical galaxies are between seven and 20 times more massive than they were nine billion years ago.²⁸ This indicates that supermassive black holes can gain mass through some other mechanism as well. And if they contain vacuum energy, they would both contribute to the expansion of the universe *and* gain mass from the process as well, in a phenomenon called, ‘cosmological coupling’.

The researchers considered that this is the first observational evidence that black holes contain vacuum energy, and when they crunched the numbers they found that this could account for the amount of the dark energy measured in the universe today, (around 68%). While there’s been no shortage of other proposed sources of dark energy, this conclusion doesn’t require anything new to be added to our existing models – the gap can be plugged by black holes as predicted by Einstein’s general theory of relativity. The new model also explains another cosmological puzzle: In current models black holes are theorized to compress everything that falls into them into an infinitely dense singularity, a point where the laws of physics break down. This should be mathematically impossible. But if black holes contain vacuum energy, singularities no longer need to exist.

- The team compared observations of elliptical galaxies, which lack star formation, in the past and in the present day. These dead galaxies have used up all their fuel. Thus, any increase in their black hole mass over this time is not due to the normal processes by which black holes grow by accumulating matter. The team considered that these black holes actually contain vacuum energy and that they are “coupled” to the expansion of the universe, so that they increase in mass as the universe expands. The idea that black holes might contain vacuum energy (a manifestation of dark energy) is not particularly new, but this latest model assumes that this energy (and therefore the mass of the black holes) would increase with time as the universe expands as a result of cosmological coupling. The team calculated how much of the dark energy in the universe they could attribute to this process. They found that black holes could potentially explain the total amount of dark energy we measure in the universe today. It is considered that this theoretical result could solve one of the most fundamental problems in modern cosmology and provides a possible origin for the dark energy in the Universe.²⁸

-In connection with the problem of the the dark energy’s provenience, a new survey of more than 200 of supermassive black holes found that the emitted jets are much more powerful than scientists thought. Astronomers don’t know what powers these jets, but they proposed the conclusion that the jets are tapping into the rotational energy of the black hole itself.²⁹ Also, it is known that the stars which are called “blue fast optical transients” (LFBOT) are much brighter than the supernovae. They light up very quickly and are extremely hot, reaching temperatures of up to nearly 40,000 degrees Celsius, and emit blue light. Supernovae normally flare up and then die out over weeks or months, but the LFBOTs flare up in just three or four days and turn off in a much shorter time period.³⁰

-The recent observation that black holes in certain Einstein-Maxwell-dilaton (EMD) theories can violate the entropy super-additivity led to the suggestion that these black holes might repel each

other without electrostatic force between them, the dilaton being the antigravity agent, (i.e. two black holes might not always attract).³¹ It was also shown that the potential of dilaton field can be taken in an exponential form and that the dilaton can be a candidate for dark energy that can explain the accelerated universe, an analytical solution of Einstein equation being found.³² These results led one to propose that and the dilaton may play the role of antigravity.³³

-In CGT³ the electronic neutrino results as couple of two super-heavy centroids of electrons with opposed e-charge, and it was deduced that sinergonic winds (of heavy etherons) are generated in the gammon → electronic neutrino conversion:

$$e^+ + e^- \rightarrow \gamma \rightarrow \nu_e + \Delta \epsilon_\gamma (\sim 0.9MeV) ; \tag{28}$$

$$(\pi^0 + \gamma \rightarrow \pi^0 + \nu_e + \Delta \epsilon_\gamma)$$

–when also the sinergonic vortices of the paired electrons are reciprocally annihilated. These sinergonic winds contribute to the mean value ρ_Λ of the dark energy” as fluxes of quanta of an antigravitic (pseudo)charge of the “black hole”.

Writing the electric field energy of an electron in the form: $\epsilon_E = \frac{1}{2} a \cdot F_e(a) = m_e c^2$, f o r : $F_{ea} = -e^2 / 4\pi\epsilon_0 a^2$ a n d $F_{eN} = -G \cdot m_e^2 / a^2$, it results for the electron’s (electro) gravitic energy, that:

$$\epsilon_G = \frac{1}{2} a \cdot F_{eN}(a) = m_e^2 G / 2a; \Rightarrow$$

$$\epsilon_E / \epsilon_G = \rho_a^0 / \rho_g^0 = 2ac^2 / m_e G = 4x10^{42}, \tag{29}$$

i.e.- the gravitic field energy of the m_e -gravitic charge is of $\sim 10^{42}$ times smaller than the etheronic energy contained by the sinergonic Γ_A -vortex of the electron’s magnetic moment: $\epsilon_s = m_e c^2 / 2$.

In consequence, according to the CGT’s electron model, (which deduces a value $E_s \approx m_e c^2$ also for the sinergonic energy contained by the volume of Compton radius: $r_\lambda = \hbar / m_e c$),³ the releasing of the sinergonic energy of the destroyed degenerate electrons of the nucleons’ quarks (considered as in CGT, as non-destructively collapsed Bose-Einstein condensate of ‘gammons’), in the process of matter →energy conversion at the surface of a black hole or inside its volume, could explain the amount and the provenience of the dark energy in the actual Universe, responsible for the Universe’s expansion, in concordance with the mentioned conclusions looking the phenomenon called ‘cosmological coupling’.

Because the radial releasing of the sinergons of destroyed Γ_A – vortices generate periodically an antigravitic (pseudo)charge $M_a = k_a m$, (m - the mass of the destroyed particle, $k_a \gg 1$), in condition of the existence of a magnetically ‘arrested’ disk of matter around the gravistar’s hard core (HC), (MAD - which contributes also to the black hole’s growing), it results that the CGT’s model of gravistar could explain not only the source of the dark energy, but also the repulsive property of some black holes in condition of the existence of a ‘dilaton’ field- considered by the EMD theories. But because in the considered gravistar’s case, this repulsive field of the central HC of black hole type can be produced only pulsatory, it raises also the question if a pulsatory gravistar can produce a removal total mechanical work L_T over a material particle or celestial body m_l on a given distance ΔL_R .

- In CGT, the force generated by gravistar’s HC as in the Fatio-LeSage’s theory, has the expression:

$$F_g = m_l k_h P_g = G m_l M_c / r^2, (P_g = \rho_g w^2 \text{ –the equivalent pressure generated by the un-compensated radial flux of (gravitonic) etherons with impulse density } \mathbf{p}_g \uparrow \downarrow \mathbf{r}; k_h = 2\pi r_h^2 / m_h = 27.4).$$

Let us suppose that at the surface of the gravistar's HC of radius R_0 , in a cubic meter is destroyed simultaneously a quantity of nucleons:

$\Delta\rho_n = \Delta M_n / 1m^3$, which—according to CGT,³ will generate a radial flux of sinergons of energy density: $\epsilon_s \approx \frac{1}{2}(\frac{1}{3}\Delta\rho_n w^2) = (\frac{1}{6})\Delta\rho_n w^2$

$$F_a = 6\pi \frac{m_t}{m_h} l_h \frac{1}{3} \rho_s v_e w = m_t k_h k_a \frac{P_s}{c\sqrt{2}} = k_A G \frac{m_t M_A}{r^2} e^{f(r)};$$

(M_A - the antigravitic charge generated by a matter quantity $\Delta M = 4\pi R_0^2 \Delta\rho_n$ simultaneously destroyed at the HC's surface ; k_A -proportionality constant, depending on the kinematic viscosity v_e of the flux of heavy etherons and on the quanton's radius, r_h ; $k_h = 27.4$).³

The exponential factor $f(r)$ is justified by the gravitational attraction over the sinergons, in the next way: Supposing an initial speed $w = c\sqrt{2}$ for the released sinergons at matter-energy conversion, after a radial distance: r characterized by a (quasi)constant gravitational acceleration a_c , the sinergons' speed will be given by the classic formula: $v_s^2 = 2c^2 - 2a_c r = 2c^2(1 - a_c r/c^2)$. For $r \gg R_0$, $v_s^2 = 2c^2 - 2GM_C(1/R_0 - 1/r)$.

By the formula: $e^x = 1 + x/1 + x^2/2 + .. + x^k/k!$, admitting the approximation: $1 + x \approx e^x$, for the previous case, ($x = -(GM_C/c^2)(1/R_0 - 1/r)$), it results that:

$$v_s \approx c\sqrt{2} \cdot e^{-\frac{GM_C}{2c^2}(\frac{1}{R_0} - \frac{1}{r})};$$

$$\Rightarrow F_a(r) = k_A G \frac{m_t M_A}{r^2} e^{-\frac{GM_C}{2c^2}(\frac{1}{R_0} - \frac{1}{r})}$$
 (31)

-If the gravistaric HC has also a magnetization M_B that generates a magnetic B-field of the form:

$B(r) = B(R_0)(R_0/r)^3 = rot.A(r)$, with $A(r) = r \cdot B(r)/2$, the sinergonic (pseudo)vortex of this magnetic potential A will generate -according to CGT, a magneto-gravitic potential $V_{gm} = m_t \cdot P_s(r)/\rho_f$ and a magneto-gravitic force: $F_{gm} = \nabla V_{gm}$, which can be estimated by applying the Bernoulli's law to the etheronic medium existent around the gravistaric HC, (composed of light and heavy etherons):

$$P_s^e(r) + P_d^s(r) = \text{constant, resulting that:}$$

$$\nabla P_s^e(r) = -\nabla P_d^s(r);$$

$$\Rightarrow F_{gm} = -\nabla V_{gm} = (m_t / \rho_f) \nabla P_d^s(r)$$
 (32)

The dynamic sinergonic pressure $P_d^s(r) = \frac{1}{2}\rho_{sv} w^2$ can be estimated by Eq.(21a) of CGT:

$$P_d^s(r) = \frac{1}{2}\rho_{sv} w^2 = A(r)w / k_1 r = \frac{1}{2}\sqrt{2}B(r) \cdot c / k_1,$$
 (33)
$$(k_1 = 4\pi a^2 / e),$$

for a variation of B(r) of the form:

$$B(r) = B(R_0) \times (R_0 / r)^3, \text{ resulting that:}$$

$$F_{gm} = \frac{m_t}{\rho_f} \nabla P_d^s = \frac{\sqrt{2}m_t c}{2k_1 \rho_f} \nabla B(r) = 3m_t K_{gm} B(R_0) \cdot \frac{R_0}{r^4};$$
 (34)
$$(K_{gm} = \sqrt{2}c / 2k_1 \rho_f)$$

resulting that:

corresponding to an impulse density: $p_s = (\frac{1}{3})\rho_{sv} w$, ($w = c\sqrt{2}$) and to a static pressure $P_s = (\frac{1}{3})\Delta\rho_n w^2$, which will generate -over each quanton m_h of a test particle m_t , (particularly -a photon), a force of Stokes type, generating a total antigravitic force:

$$\left(k_A = \frac{k_a}{\sqrt{2}c} = \frac{6v_e}{\sqrt{2}r_h c}; f(r) \leq 0 \right)$$
 (30)

$$V_{gm}(r) = -m_t K_{gm} B(R_0) \cdot (R_0^3 / r^3).$$
 (34')

By $k_1 = 4\pi a^2 / e = 1,56 \times 10^{-10}$ [m²/C] and taking for ρ_f the value obtained in CGT for the inertial mass of the vecton (vector photon of ~ 3K-radiation and of electric field, of mass $m_f \approx 2.3 \times 10^{-40}$ kg):

$$\rho_f \approx 3.6 \times 10^{19} \text{ kg/m}^3, \text{ it results that:}$$

$$K_{gm} = (\sqrt{2}c / 2k_1 \rho_f) \approx 3.766 \times 10^{-2} [\text{m}^2 \text{C} / \text{s} \cdot \text{kg}].$$

Considering that the gravistaric HC is a charged rotational black hole of 25 M_s (M_s -solar mass: $\approx 2 \times 10^{30}$ kg) and radius $R_0 \approx (2 \div 3) \times 10^4$ m, that has also a magnetaric B-field of $\approx 10^{11}$ T -at its surface, it results that:

$$F_{gm}(R_0) / m_t = 3K_{gm} B(R_0) \cdot (1/R_0) = 3 \times 3.76 \times 10^{-2} \times 10^{11} / 2.5 \times 10^4 = 4.5 \times 10^5 \text{ N/kg.}$$

In the same time, the Newtonian force/kg will be:

$$F_g(R_0) / m_t = GM_C / R_0^2 = 5.3 \times 10^{12} \text{ N / kg.}$$

It results- in consequence, that even if HC is magnetaric, the gravitomagnetic force is negligible compared to the Newtonian gravitic force generated by a relative small stellar black hole, and can be neglected. So, the HC must be a black hole in a purely gravitational sense, for retain also relativist particles and pseudo-scalar photons. However, the magneto-gravitic force F_{gm} of Magnus type, generated by the sinergonic vortex Γ_A corresponding to the sinergonic energy of the magnetic A-potential of the HC's B-field, remains of values that maintain quantons and vector photons and electrons around the gravistar's HC.

-For $r < R_p$, by considering a short time $\delta\tau$ of existence of the antigravitic (pseudo)charge

$M_A \gg M_C$, it is understood that the particles m_t of the magnetically 'arrested' accretion disk (MAD) will be rejected with a force $F_a(r)$ that will produce a mechanic work: $L_a \approx \frac{1}{2}F_a(r) \cdot d\tau \cdot c$ (admitting the conclusion that the test particle m_t obtains a relativist speed in the time $\delta\tau$).

The obtained kinetic energy $E_k \approx \frac{1}{2}m_t \cdot c^2$ will be lost by the test particle on a distance Δl_a as consequence of the mechanic work L_G produced mainly by the gravitation force: $F_g(r)$ (and by $F_{gm}(r) \ll F_g(r)$), i.e.:

$$L_G = \int (F_g(r) + F_{gm}(r)) dr \approx \int F_g dr = (\bar{F}_g)_l \cdot \Delta l_a,$$
 (35)
$$(\bar{F} - \text{mean force}).$$

It results that:

$$\Delta l_a = L_a / (\bar{F}_g)_l ; \Delta t_l = \Delta l_a / \bar{v}_s = c \times m_t / \bar{F}_g$$
 (36)

So, inside the volume of radius $R_l = R_0 + \Delta l_a$, ($r \leq R_l$), if the τ -period between the antigravitic (short) pulses δt satisfy the condition: $\tau \geq 2\Delta t_l$, the MAD will be gradually destroyed at the HC's surface, (with a period τ between the moments $\delta\tau$ of M_A -antigravitic

(pseudo)charge' generating), with the releasing of mixed radiation (including X-rays, gamma radiation and electronic neutrinos). But because in the polar zones the radial speed of these emitted jets are less affected (diminished) by the dynamic pressure $P_{\Gamma_d} \approx \frac{1}{2} \rho_T c^2$ of the etherono-quantonic vortex Γ_μ^C of the HC's magnetic field, the fact that the spinning surface of the gravistar's HC can emit relativist jets of particles and photonic radiation, as it was astrophysically

observed, excepting the released sinergons, which are slowed by the gravitational F_g -force but not retained by the HC's gravitic field, (F_{gm} not acting on sinergons, on their volume, because it is generated by sinergons with approximately the same volume).

-For $r > R_p$, an external body gravitationally attracted by HC can be repelled by the periodically generated M_A -antigravitic charge, up to a distance $R_R > R_p$, given by the equality: $L_a(\tau, R) = \bar{F}_g \Delta R$.

For $r = R_l$, $E(m_t; R_l) \approx \frac{1}{2} m_t c^2$, because: $L_G \approx \int (F_g(r)) dr = (V_g)_{R_2} - (V_g)_{R_1} = V_g(R_2) - V_g(R_1)$, it results that:

$$L_a(\tau, R_l) \approx \frac{1}{2} \delta\tau \cdot c \cdot F_a(R_0) = \frac{1}{2} \delta\tau \cdot c \cdot k_A G \frac{m_t M_A}{R_0^2} \approx \frac{1}{2} m_t c^2 = G \cdot m_t M_C \left(\frac{1}{R_0} - \frac{1}{R_l} \right) \quad (37)$$

For $r \gg R_p$, it results that: $(1/R_0 - 1/r) \approx 1/R_0$, and to a distance $\Delta R_L = R_R - R_L \approx R_R$, we have:

$$L_a(\tau; R_L) \approx \frac{1}{2} \delta\tau \cdot v_t(R_L) \cdot F_a(R_L) = \frac{1}{2} \delta\tau \cdot v_t(R_L) \cdot k_A G \frac{m_t M_A}{R_L^2} e^{-\frac{GM_C}{2c^2 R_0}} \approx \frac{1}{2} m_t v_t^2(R_L) = G \cdot m_t M_C \left(\frac{1}{R_L} - \frac{1}{R_R} \right) \quad (38)$$

(by considering v_s as quasi-constant on distances comparable with the diameter of m_t -test-particle).

From Eq. (37) it results that: $\delta t = R_0^2 c / k_A G \cdot M_A$, and with $r_s = 2GM_C / c^2$, Eq.(38)

becomes:

$$L_a(R_L; \tau) = c \cdot v_t(R_L) \cdot m_t \left(\frac{R_0}{R_L} \right)^2 \cdot e^{-\frac{r_s}{4R_0}} \approx \frac{1}{2} m_t v_t^2(R_L) = G \cdot m_t M_C \left(\frac{1}{R_L} - \frac{1}{R_R} \right); \quad (39)$$

that- because the antigravitic field generated by the antigravitic charge G_A vary approximately with:

$r^{-2} \times e^{-r/4R_0}$, conform to Eq. (38), (because the spherical distribution of the released sinergons and the gravitationally reducing of their speed), to distances $R > R_l$, will give:

$$v_t(R_L) = \tau \frac{\bar{F}_a(R_L)}{m_t} \approx c \cdot \left(\frac{R_0}{R_L} \right)^2 \cdot e^{-\frac{r_s}{4R_0}} \quad (40)$$

and:

$$E_k(R_L) = \frac{1}{2} m_t v_t^2(R_L) = \frac{1}{2} m_t c^2 e^{-\frac{r_s}{2R_0}} \left(\frac{R_0}{R_L} \right)^4 = G m_t M_C \left(\frac{1}{R_L} - \frac{1}{R_R} \right) \quad (41)$$

Because the sinergonic pulses of duration δ generates gravitational waves, for $R \gg R_0$ we must have- by Eq. (31): $v_s(r) = w \cdot e^{-rs/4R_0} > c$, i.e.:

$r_s / 4R_0 < \ln \sqrt{2}; R_0 > 0.7276 r_s$, i.e. it can be black hole in purely gravitational sense, for $r_s > R_0 > 0.7276 r_s$.

For R_0 a little lower than $r_s = 2GM_C/c^2$, (the HC's Schwarzschild radius), said: $R_0 = 0.9r_s$, we will have: $v_s(R) = 1.07c$. Writing:

$$R_R = R_L / k_R, (k_R < 1), \text{ Eq.(41) may be written as: } \frac{1}{2} m_t c^2 e^{-\frac{r_s}{2R_0}} \left(\frac{R_0^4}{R_L^3} \right) = G m_t M_C (1 - k_R) = L_a(R_R; \tau) / R_L \quad (42)$$

Some particular values of M_C and R_0 can be relevant:

a1)-Taking in Eq. (37) $M_C = 10^6 M_s = 2 \times 10^{36}$ kg and $R_0 = 0.9r_s = 2.668 \times 10^9$ m, (super-massive black hole), we obtain for R_l the value:

$$R_l = 2.668 \times 10^{10} \text{ m.}$$

From Eq. (37) it results that $\Delta R_l = R_l - R_0 = 2.4 \times 10^{10}$ m and $\bar{a}_l = \bar{F}_l / m_t = c^2 / 2\Delta R_l = 1.875 \times 10^6$ N/kg, so the test particle loses its kinetic energy in a time:

$$\Delta t = c / \bar{a}_l \approx 160 \text{ s, (0.0(4) hr.)}$$

If the test particle is a nucleus from the MAD, it results that $\tau_1 = 2\Delta t = 0.0(8)$ hr.

a2)- Taking in Eq. (37) $M_C = 10^9 M_s = 2 \times 10^{39}$ kg and $R_0 = 0.9r_s = 2.668 \times 10^{12}$ m, (super-massive b. h.), we obtain for R_l the value:

$$R_l = 2.2 \times 10^{13} \text{ m.}$$

From Eq. (37) it results that $\Delta R_l = R_l - R_0 = 1.93 \times 10^{13}$ m and $\bar{a}_l = \bar{F}_l / m_t = c^2 / 2\Delta R_l = 2328$ N/kg, so the test particle loses its kinetic energy in a time: $\Delta t = c / \bar{a}_l \approx 1.2884 \times 10^5$ s, (35.8 hr.).

If the test particle is a nucleus from the MAD, it results that $\tau_2 = 2\Delta t = 71.6$ hr.

The sinergons of the antigravitic pulses, released with $w = c\sqrt{2}$, will have at the limit R_l a kinetic energy:

$$E_s(R_l) = \frac{1}{2} m_s w^2 - \bar{F}_l \Delta R_l = \frac{1}{2} m_s w^2 - \frac{1}{2} m_s c^2 = \frac{1}{2} m_s c^2,$$

($w = c\sqrt{2}$)

(43)

and the antigravitic pulses can be detected as gravitational waves.

The energy lost by sinergon at $r \rightarrow \infty$ will be:

$$\delta E_s \approx V_g(R_1) = 6 \times 10^{-45} J \approx 0.1 E_s(R_1) ;$$

(For obtain $E_s(\infty) = \frac{1}{2} m_s c^2$ would be necessary to have:

$$w(R_0) = 1.4866c .$$

-b)-For $r > R_1$, by taking $R_L = 2R_1 = 4.4 \times 10^{13} m$, in the previous case, a2):

$$R_0 = 0.9 r_s = 2.668 \times 10^{12} m, (r_s = 2.964 \times 10^{12} m), \text{ by Eq. (42) it results:}$$

$$R_R = 4.40066 \times 10^{13} m; \Delta R = (R_R - R_L) = 6.6 \times 10^9 m;$$

$$\text{Eq. (40) gives: } v(R_L) = 8.18 \times 10^5 m/s ; \Delta t = 2\Delta R / v(R_L) = 1.613 \times 10^4 s, (4.48 h < \tau_2) ;$$

The same conclusion ($\Delta t < \tau$) is obtained also for the case a1), by taking $R_L = 2R_1$.

- Extrapolating, we can conclude that the sinergons released by the destruction (by matter→energy conversion) of the MAD cannot generate an expansion of the matter existing over the limit R_1 , but the generated antigravitic (pseudo)charge can interrupt periodically the matter's ,eating ,by the black hole. An argument for this conclusion can be also the fact that a team of astrophysicists observed tidal disruption events to a white dwarf named Swift J0230 observed in X-rays spectrum, with a mass of three times the Eart's mass, each time when it passes close to the black hole existent in the center of the galaxy named 2MASX J02301709+2836050, a small one with a mass of about 10,000 to 100,000 times the sun's mass. Regular observations of Swift J0230 revealed a rapid drop in the star's brightness on the fourth day. According to the new study, that's the point at which it dimmed by a factor of 20 in just 57 kiloseconds (15.8 hours). Shortly after, the star became elusive to telescope observations. But why this black hole only partially disrupts the star is not very well understood.³⁴

However, the HC's antigravitic charge M_A can be generated also by matter→energy conversion inside the gravitaric HC, if we consider a HC's shell of cold current strange quarks forming a crystalline network, (as in the model of the known quark star made entirely of quark matter, which would be stable if they quickly transform into strange quark matter),³⁵ or even of nucleons in quasi-crystalline state (depending on the HCl's mass), taking into account the fact that the high density of the quak matter and the strong force nucleons ensures – at $T \rightarrow 0K$, a high inter-quarks force and binding energy, (at least tens of MeV/current quark), which can determine the resistance of the HC's surface at high internal pressure P_i , and the fact that the sinergons released by the destroyed matter and radially emitted can penetrate the HC's shell of strange quarks matter.

The possible cause of the interior destruction of nucleons inside the gravitaric HC is not only the pressure given by the gravitational attraction of its inner part, but also a small difference between the angular rotation speed ω of this inner part HCl-supposed to be of gravitic black hole type (network of current quarks considered in CGT's model) and its rotated shell, HCe, formed by strange current quarks, (in conformity with Ref.³⁵). This angular rotation speed difference $\Delta\omega = (\omega_2 - \omega_1) = \omega_1 - \omega_2$ (Figure 1) will generate a neutronic liquid shell F, when $\Delta\omega$ increases and decreases periodically changing its sign, as a consequence of HCe's growth, similar to the case of the Earth's convective liquid inner shell (of ionized atoms) which- in Bullard's self-exciting dynamo model³⁶ explains the generating of Earth's magnetic field.

Inside this neutronic liquid shell, matter→energy conversion can be generated due the high radial pressure gravitationally generated by the attraction of the inner part Hci, conform to the model. -If the antigravitic (pseudo)charge $M_A \gg M_C$ of the inner part HCl cannot destroy the solid shell HCe, but is enough high for cancel the gravitational attraction of HCl and for generate matter's expansion, it is able to generate a mechanic work higher than that of the gravitational force: $L_a > L_g$, if its duration $\delta\tau$ is enoug high and its generating period is $\tau \rightarrow \Delta t_1$.

The generated antigravitic field, can be- in this case, a natural equivalent of the dilaton field of the EMD theories.

The internal pression must satisfy the equation:

$$P < 2\sigma_s / R_s, (\sigma_s \approx E / A = F_q / l_q) \tag{44}$$

with: σ_s -the superficial tension of HCe; F_q –the strong force between two current strange quarks at

$l_q \approx 2r_q \approx 0.4$ fm (the approximate diameter's value of a preonic current quark; R_s –the inner radius of HCe –shell) or between two cold nucleons at ~ 1 fm inter-distance, (depending on the HCl's mass).

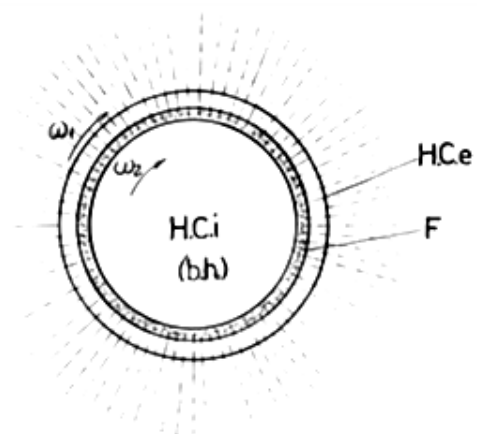


Figure 1 Antigravitic (pseudo)charge generating by matter→energy conversion inside the gravistar's HC.

Conclusion

By the author's cold genesis theory (CGT), based on the Galileian relativity, it was argued the possibility to explain the massic spectrum of the elementary particles by two species of preonic quasi-crystalline quarks: A) preonic –formed by basic preons $z^0(34 m_e)$ which form bosonic preons $z_2(4z^0)$ and $z_\pi(7z^0)$, and B) quarkonic – formed

by 3ⁿ preonic quarks ($4 \geq n \geq 1$) (mainly $-v$ - or/and s -quarks) or as crystalline cluster of $7 \times 5 = 35$ preonic or quarkonic quarks : ($p^+; n^-$) – nucleonic quarks or λ^+, s^+, v^+ – preonic quarks, or c - or b - quarkonic quarks.

Because in CGT the z^0 –preon is a crystalline cluster of degenerate paired electrons (gammons' $-\gamma^*(e^-e^+)$), considered in a vortical model and the considered etherono-quantonic vortex of the electron's magnetic moment is essential in CGT for the natural explaining of the strong force (between quarks) and of the nuclear force (between nucleons), it was also argued that the existence of a permanent etherono-quantonic vortex around the super-dense kernel of electron is possible by its interaction with etherono-quantonic winds which represent a main negentropic component of the quantum vacuum, associated with its subquantum and quantum dynamic pressure, whose gradient generates a static pressure gradient of a brownian component of the etherono-quantonic medium, in conformity with the Bernoulli's law applied to the etheronic medium whose 'sinergonic' component of heavy etherons ($m_s \approx 10^{-60} \text{ kg}$) (which can explain effects of a physical nature of the magnetic potential A) generate also a centripetal vortical force of Magnus type over the, quantons' ($m_h \approx h \times 1/c^2$) and over the inertial (dense) mass of vortexed vector photons, which equilibrate the centrifugal force. The vortical nature of the magnetic moment is argued also by the perpetual rotation of the atomic electrons.

Similarly, as consequence, in CGT can be argued a model of 'gravistar' –similar to the, gravistar' model proposed by Mottola and Mazur, having a shell of dark energy but also of photons vortexed around a rotational hard core (HC) of black hole type which –by matter→energy conversion. This conversion is produced with the releasing of heavy etherons of the destroyed degenerate electrons' vortices as well, which generate periodically an antigravitic (pseudo) charge M_A of the HC.

It was argued that a HC's antigravitic (pseudo)charge generated by matter→energy conversion produced by gravitational attraction and periodically produced destruction of an accretion disk, (particularly –of MAD type, i.e. magnetically, arrested'), is insufficient for generating a total mechanic work L_T (generated by M_A and M_g) of matter's expansion, but this possibility ($L_T > 0$) could be produced by an antigravitic (pseudo) charge M_A of an internal solid core HCi of HC, generated by the friction between its surface and the interior surface of a crystalline shell HCe, of current cold strange quarks or even of nucleons in quasi-crystalline state (depending on the HCi's mass), as consequence of an angular rotation speed' difference between HCi and HCe, which could be increasing and decreasing periodically changing its sign. The antigravitic field of this M_A –(pseudo)charge could be –in a such case, a natural equivalent of the 'dilaton' field considered in EMD theories.

Acknowledgments

None.

Conflicts of Interest

None.

References

1. Patrignani C, Agashe K, Aielli G, et al. Particle data group. *Chin Phys C*. 2016;40:100001.
2. Andersson B, Gustafson G, Ingelman G, et al. Parton fragmentation and string dynamics. *Phys Rep*. 1983;97(2–3):31–145.
3. Arghirescu M. The material structures genesis and fields effects. MatrixRom. 2006. *The cold genesis of matter and fields*. Science Publishing Group. 2015.
4. Arghirescu M. A preonic quasi-crystal quark model based on a cold genesis theory and on the experimentally evidenced neutral boson of 34 Me. *Global J of Phys*. 2016;5(1):496–504.
5. Arghirescu M. A model of particles cold forming as collapsed Bose–Einstein condensate of gammons. *Phys Astron Int J*. 2018;2(4):260–267.
6. Hellman Olavi. A proposed elementary particle theory based on interacting classical fields. Turun Yliopisto, Turku-preprint. 1961.
7. Krasznahorkay AJ, Csatlós M, Csige L, et al. Observation of anomalous internal pair creation in 8Be: A possible signature of a light, Neutral Boson. arXiv: 1504.01527v1. [nucl-ex]. 2015.
8. Sarri G, Poder K, Cole J, et al. Generation of neutral and high-density electron–positron pair plasmas in the laboratory. *Nature Comm*. 2015;6:6747.
9. Arghirescu M. The nuclear force explaining by a bag model resulted from a vortical, cold genesis model of nucleon. *Phys Astron Int J*. 2018;2(4):349–358.
10. Souza ME. Calculation of almost all energy levels of baryons. *Papers in Physics*. 2011;3:ART.030003.
11. Carrigan RA Jr. Compound quarks as an explanation for the apparent quark mass spectrum. *Fermi Nat Accelerator Lab*. 1978.
12. Arghirescu M. An explanatory model of heavy quarks and particles generating resulted by a cold genesis theory. *Theor Phys Lett*. 2011;9(11).
13. Griffiths D.J. *Introduction to elementary particles* (2nd revised ed.). Wiley-VCH. 2008;181–188.
14. Sakharov AD. Mass formula for mesons and baryons. *Zh Eksp Teor Fiz*. 1980;78:2112–2115.
15. Arghirescu M. A preonic model of quarks and particles, based on a cold genesis theory. In book: *Redefining standard model particles physics*. IntechOpen. 2023.
16. Arghirescu M. The nature of the 1 MeV-gamma quantum in a classic interpretation of the quantum potential. *Phys Tomorrow Lett*. 2023;18(6):631–6657.
17. Arghirescu M. A photon model resulted by a pre-quantum theory of fields. *Bull Polytech Inst Iasi Theor Mech Phys*. 2015;LXI(3):35–47.
18. Popescu II. Ether and etherons –a possible reappraisal of the ether concept. *Stud Cerc de Fizica*. 1982;34:451–468.
19. Meyer HO. Spontaneous electron emission from a cold surface. *Europhys Lett*. 2010;89(5):58001.
20. Mottola E, Mazur PO. Gravitational condensate stars: an alternative to black holes. *Universe*. 2003;9(2):88.
21. Kundt W. A Uniform Description of All the Astrophysical Jets. *Proceedings of Science*. 2014.
22. Hirofani K, Iguchi S, Kimura M, et al. Pair Plasma Dominance in the Parsec- Scale Relativistic Jet of 3C 345". *The Astrophysical Journal*. 2000;545(1):100–106.
23. Schild RE, Leiter DJ, Robertson SL. Observations Supporting the Existence of an Intrinsic Magnetic Moment inside the Central Compact Object within the Quasar Q0957+561. *The Astronomical Journal*. 2006;132(1).
24. RD Blandford, RL Znajek. Electromagnetic extraction of energy from Kerr black holes. *Mon Not R Astr Soc*. 1977;179:433–456.
25. Naeye R, Gutro R. Vast Cloud of Antimatter Traced to Binary Stars. NASA. 2008.

26. Gong-Bo Z, Raveri M, Pogosian L, et al. Dynamical dark energy in light of the latest observations. *Nature Astronomy*. 2017;1:627–632.
27. Bostick WH. The Hubble expansion as ascribed to mutual magnetic induction between neighboring galaxies. *Laser and Particle Beams*. 1988;6(3):405–408.
28. Farrah D, Petty S, Croker KS, et al. A Preferential Growth Channel for Supermassive Black Holes in Elliptical Galaxies at $z \lesssim 2$. *The Astrophysical Journal*. 2023;943.
29. Clery D. What powers a black hole's mighty jets?. *Science*. 2014;19.
30. Andreoni I, Coughlin MW, Perley DA. A very luminous jet from the disruption of a star by a massive black hole. *The Astrophysical Journal*. 2023;943:133.
31. Lü H, Wang, Zhao-Long, et al. Black holes that repel. *Phys Rev D* 99. 2019;101502.
32. Lu HQ, Huang ZG, Fang W, et al. Dark Energy and Dilaton Cosmology. 2004.
33. Gibbons GW, Wells CG. Antigravity bounds and the Ricci tensor. 1993.
34. Evans PA, Nixon CJ, Campana S, et al. Monthly quasi-periodic eruptions from repeated stellar disruption by a massive black hole. *Nature astronomy*. 2023.
35. Weber F, Kettner C, Weigel MK, et al. "Strange-matter Stars". Internat. Symp on Strangeness and Quark Matter, Kolymbari, Greece, 1-5 Sep (1994). Singapore: World Scientific. pp. 308–317.
36. Bullard EC. The magnetic Field within the Earth. Proceedings of the Royal Society of London, Series A, Math and Physical Sciences. 1949;197(1051):433–453.